

RE: USA National Phase Filing of PCT/FI99/01083

1018 Rec'd PCT/FI 27 JUN 2001

24. Attached:

25 Per Item 17.c2, **cancel original** pages #__, claims #__, Drawing Sheets #

26. **Calculation of the U.S. National Fee (35 U.S.C. 371 (c)(1) and other fees is as follows:**

Based on amended claim(s) per above item(s) 12, 14, 17, 25 (hilit)

Total Effective Claims	19	minus 20 =	0	x \$18/\$9	=	\$0	966/967
Independent Claims	4	minus 3 =	1	x \$80/\$40	=	\$80	964/965
If any proper (ignore improper) Multiple Dependent claim is present,				add\$270/\$135	+	0	968/969

BASIC NATIONAL FEE (37 CFR 1.492(a)(1)-(4)): →→ BASIC FEE REQUIRED, NOW →→→→

A. If country code letters in item 1 are not "US", "BR", "BB", "TT", "MX", "IL", "NZ", "IN" or "ZA"

See item 16 re:

1. Search Report was <u>not</u> prepared by EPO or JPO -----	add\$1000/\$500		960/961
2. Search Report was prepared by EPO or JPO -----	add\$860/\$430	+860	970/971

SKIP B, C, D AND E UNLESS country code letters in item 1 are "US", "BR", "BB", "TT", "MX", "IL", "NZ", "IN" or "ZA"

→ <input type="checkbox"/> B. If <u>USPTO</u> did not issue <u>both</u> International Search Report (ISR) and (if box 4(b) above is X'd) the International Examination Report (IPER), -----	add\$1000/\$500	+0	960/961
(only) → <input type="checkbox"/> C. If <u>USPTO</u> issued ISR but not IPER (or box 4(a) above is X'd), -----	add\$710/\$355	+0	958/959
(these) (4) → <input type="checkbox"/> D. If <u>USPTO</u> issued IPER but IPER Sec. V boxes <u>not all 3</u> YES, -----	add\$690/\$345	+0	956/957
(boxes) → <input type="checkbox"/> E. If international preliminary examination fee was paid to <u>USPTO</u> and Rules 492(a)(4) and 496(b) <u>satisfied</u> (IPER Sec. V <u>all 3</u> boxes YES for <u>all</u> claims), -----	add \$100/\$50	+0	962/963
SUBTOTAL =		\$940	

28. If Assignment box 19 above is X'd, add Assignment Recording fee of ----\$40 +0 (581)

29. Attached is a check to cover the ----- **TOTAL FEES \$940**

Our Deposit Account No. 03-3975
Our Order No. 60258 | 281450
C# | M#



00909

CHARGE STATEMENT: The Commissioner is hereby authorized to charge any fee specifically authorized hereafter, or any missing or insufficient fee(s) filed, or asserted to be filed, or which should have been filed herewith or concerning any paper filed hereafter, and which may be required under Rules 16-18 and 492 (missing or insufficient fee only) now or hereafter relative to this application and the resulting Official document under Rule 20, or credit any overpayment, to our Account/Order Nos. shown above for which purpose a duplicate copy of this sheet is attached.

This CHARGE STATEMENT does not authorize charge of the issue fee until/unless an issue fee transmittal form is filed

**Pillsbury Winthrop LLP
Intellectual Property Group**

By Atty: Christine H. McCarthy Reg. No. 41844

Sig: [Signature] Fax: (703) 905-2500
Tel: (703) 905-2143

Atty/Sec CHM/JRH

NOTE: File in duplicate with 2 postcard receipts (PAT-103) & attachments.

09/869247

JC18 Rec'd PCT/PTO 27 JUN 2001

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
REQUEST FOR FILING NATIONAL PHASE OF
PCT APPLICATION UNDER 35 U.S.C. 371 AND 37 CFR 1.494 OR 1.495

To: Hon. Commissioner of Patents
Washington, D.C. 20231



00909

TRANSMITTAL LETTER TO THE UNITED STATES
DESIGNATED/ELECTED OFFICE (DO/EO/US)

Atty Dkt: P 281450 /2980715US/Hs/kp
M# /Client Ref.

From: Pillsbury Winthrop LLP, IP Group:

Date: June 27, 2001

This is a **REQUEST** for **FILING** a PCT/USA National Phase Application based on:

1. International Application <u>PCT/FI99/01083</u> ↑ country code	2. International Filing Date <u>28 December 1999</u> Day MONTH Year	3. Earliest Priority Date Claimed <u>31 December 1998</u> Day MONTH Year (use item 2 if no earlier priority)
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4. Measured from the earliest priority date in item 3, this PCT/USA National Phase Application Request is being filed within:

(a) 20 months from above item 3 date (b) 30 months from above item 3 date,

(c) Therefore, the due date (unextendable) is June 30, 2001

5. Title of Invention CONTROL OF GATEWAY SUPPORT NODE

6. Inventor(s) PUUSKARI

Applicant herewith submits the following under 35 U.S.C. 371 to effect filing:

7. Please immediately start national examination procedures (35 U.S.C. 371 (f)).

8. **A copy of the International Application** as filed (35 U.S.C. 371(c)(2)) is transmitted herewith (file in in English but, if in foreign language, file only if not transmitted to PTO by the International Bureau) including:

- a. Request;
- b. Abstract;
- c. 18 pgs. Spec. and Claims;
- d. 4 sheet(s) Drawing which are informal formal of size A4 11"

9. **A copy of the International Application has been transmitted by the International Bureau.**

10. **A translation of the International Application** into English (35 U.S.C. 371(c)(2))

- a. is transmitted herewith including: (1) Request; (2) Abstract; (3) _____ pgs. Spec. and Claims; (4) _____ sheet(s) Drawing which are: informal formal of size A4 11"
- b. is not required, as the application was filed in English.
- c. is not herewith, but will be filed when required by the forthcoming PTO Missing Requirements Notice per Rule 494(c) if box 4(a) is X'd or Rule 495(c) if box 4(b) is X'd.
- d. Translation verification attached (not required now).

RE: USA National Phase Filing of PCT /FI99/01083

JC18 Rec'd PCT/PTO 2 7 JUN 2001

- 11. Please see the attached Preliminary Amendment
- 12. Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)), i.e., **before 18th month from first priority date above in item 3, are transmitted herewith (file only if in English) including:**
- 13. PCT Article 19 claim amendments (if any) have been transmitted by the International Bureau
- 14. Translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)), i.e., of **claim amendments** made before 18th month, is attached (**required by 20th month from the date in item 3 if box 4(a) above is X'd, or 30th month if box 4(b) is X'd, or else amendments will be considered canceled**).

- 15. **A declaration of the inventor** (35 U.S.C. 371(c)(4))
 - a. is submitted herewith Original Facsimile/Copy
 - b. is not herewith, but will be filed when required by the forthcoming PTO Missing Requirements Notice per Rule 494(c) if box 4(a) is X'd or Rule 495(c) if box 4(b) is X'd.

- 16. **An International Search Report (ISR):**
 - a. Was prepared by European Patent Office Japanese Patent Office Other
 - b. has been transmitted by the international Bureau to PTO.
 - c. copy herewith (1 pg(s).) plus Annex of family members (1 pg(s).).

- 17. **International Preliminary Examination Report (IPER):**
 - a. has been transmitted (if this letter is filed after 28 months from date in item 3) in English by the International Bureau with Annexes (if any) in original language.
 - b. copy herewith in English.
 - c.1 IPER Annex(es) in original language ("Annexes" are amendments made to claims/spec/drawings during Examination) including attached amended:
 - c.2 Specification/claim pages #__ claims #
Dwg Sheets #
 - d. Translation of Annex(es) to IPER (**required by 30th month due date, or else annexed amendments will be considered canceled**).

- 18. **Information Disclosure Statement** including:
 - a. Attached Form PTO-1449 listing documents
 - b. Attached copies of documents listed on Form PTO-1449
 - c. A concise explanation of relevance of ISR references is given in the ISR.

- 19. **Assignment** document and Cover Sheet for recording are attached. Please mail the recorded assignment document back to the person whose signature, name and address appear at the end of this letter.

- 20. Copy of Power to IA agent.

- 21. **Drawings** (complete only if 8d or 10a(4) not completed): __ sheet(s) per set: 1 set informal; Formal of size A4 11"

- 22. Small Entity Status is **Not** claimed is claimed (**pre-filing confirmation required**)
- 22(a) __ (No.) Small Entity Statement(s) enclosed (since 9/8/00 Small Entity Statements(s) not essential to make claim)

- 23. **Priority** is hereby claimed under 35 U.S.C. 119/365 based on the priority claim and the certified copy, both filed in the International Application during the international stage based on the filing in (country) FINLAND of:

	<u>Application No.</u>	<u>Filing Date</u>		<u>Application No.</u>	<u>Filing Date</u>
(1)	982855	31 December 1998	(2)		
(3)			(4)		
(5)			(6)		

- a. See Form PCT/IB/304 sent to US/DO with copy of priority documents. If copy has not been received, please proceed promptly to obtain same from the IB.
- b. Copy of Form PCT/IB/304 attached.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re National Stage application for PCT/FI99/01083

PUUSKARI

Group Art Unit: Not Yet Assigned

Appln. No.: Not Yet Assigned

Examiner: Not Yet Assigned

Filed: June 27, 2001

FOR: CONTROL OF GATEWAY SUPPORT NODE SELECTION

* * * * *

June 27, 2001

PRELIMINARY AMENDMENT

Hon. Commissioner of Patents
Washington, DC 20231

Sir:

Prior to beginning examination, kindly amended the application as follows:

IN THE SPECIFICATION:

Just after the title at the top of the page, please insert the following:

This application is the National Stage of International Application PCT/FI99/01083 filed December 28, 1999 which designated the U.S. and that International Application was filed in English.

IN THE CLAIMS:

Kindly amend the following claims:

1. (Amended) A method of controlling selection of a gateway support node to be used in a telecommunications system which comprises at least one support node serving a subscriber of the telecommunications system, a first and a second gateway support node, wherein the method comprises the steps of:

defining at least one condition for the first gateway support node, so that when the condition is fulfilled, the second gateway support node is more suitable for transmitting packets,

detecting that the condition is fulfilled, and

sending a first message indicating the second gateway support node to the serving support node.

2. (Amended) A method according to claim 1, the method further comprising the steps of:

receiving in the first gateway support node a second message which indicates that a tunnel for transmitting packets between the subscriber and an external data network is to be established between the serving support node and the first gateway support node,

checking said condition, and

transmitting a first message to the serving support node if said condition is fulfilled, or establishing a tunnel if said condition is not fulfilled.

3. (Amended) A method according to claim 2, wherein if the tunnel is established between the serving support node and the first gateway support node, the method further comprises the steps of:

detecting a change in operating conditions in the first gateway support node,

checking said condition, and

transmitting a third message indicating said second gateway support node to the serving support node and removing the tunnel in the first gateway support node if said condition is fulfilled.

4. (Amended) A method according to claim 3, wherein the system is a GPRS system and said first and third messages are response messages to a 'Create PDP Context' request.

5. (Amended) A method according to claim 2, wherein if the tunnel is established between the serving support node and the first gateway support node, the method further comprises the steps of:

detecting a change in operating conditions in the first gateway support node,

checking said condition, and

performing the next steps if said condition is fulfilled:

transmitting a fourth message indicating said second gateway support node to the serving support node,

waiting for an acknowledgement to said fourth message,

receiving the acknowledgement, and

removing the tunnel in the first gateway support node in response to a positive acknowledgement.

6. (Amended) A method according to claim 5, wherein the system is a GPRS system and said first and fourth messages are response messages to a 'Create PDP Context' request.

7. (Amended) A method according to claim 1, the method further comprising the steps of:

establishing a tunnel between the serving support node and the first gateway support node,

detecting a change in operating conditions in the first gateway support node,

checking said condition, and

transmitting a first message to the serving support node if said condition is fulfilled.

8. (Amended) A method according to claim 7, wherein if fulfilment of said condition is detected, removing the tunnel in the first gateway support node in response to the transmission of said first message.

9. (Amended) A method according to claim 7, wherein if fulfilment of the condition is detected,

waiting for an acknowledgement to the first message,

receiving the acknowledgement, and

removing the tunnel in response to a positive acknowledgement.

10. (Amended) A packet-switched telecommunications system comprising a support node serving the subscriber of the telecommunications system, a first and a second gateway support node, wherein

in response to fulfilment of a predefined condition, the first gateway support node is arranged to send to the serving support node a first message indicating the second gateway support node which is more suitable for transmitting packets, and

in response to receiving the first message, the serving support node is arranged to activate establishment of the tunnel to be used in transmission of packets with the second gateway support node indicated.

11. (Amended) A telecommunications system according to claim 10, wherein the telecommunications system comprises a database where information on the second gateway support nodes defined for the first gateway support node is maintained, and the first gateway support node is arranged to retrieve the most suitable second gateway support node from the database when the predefined condition is fulfilled.

12. (Amended) A telecommunications system according to claim 10 wherein the first gateway support node is arranged to check at least one predefined condition in response to receiving a message requesting establishment of a tunnel from the serving support node.

13. (Amended) A telecommunications system according to claim 10, wherein the telecommunications system comprises a tunnel used for transmitting packets between the serving support node and the first gateway support node, and the first gateway support node is arranged to detect a change in operating conditions and check at least one of said predefined conditions in response to detecting the change.

14. (Amended) A gateway support node of a packet network which is arranged to communicate with the support node serving a subscriber of the packet network, wherein the gateway support node is arranged to transmit, in response to fulfilment of a predefined condition, a first message indicating another gateway support node which is more suitable for transmitting packets to the serving support node.

15. (Amended) A gateway support node according to claim 14, wherein the gateway support node is arranged to check at least one said predefined condition in response to receiving a message requesting establishment of a tunnel from the serving support node.

16. (Amended) A gateway support node according to claim 14 wherein there is a tunnel used for transmitting packets between the gateway support node and the serving support node, and the gateway support node is arranged to detect a change in operating conditions and check at least one said predefined condition in response to detecting the change.

17. (Amended) A support node serving a subscriber of a packet network which is arranged to communicate with at least a first and a second gateway support node of the packet network, wherein

the serving support node is arranged, in response to the address of the second gateway support node included in the message received from the first gateway support node, to activate establishment of a tunnel used for transmitting packets with said second gateway support node .

18. (Amended) A serving support node according to claim 17, being further arranged to remove the existing tunnel to the first gateway support node in response to activation of tunnel establishment with the second gateway support node.

19. (Amended) A serving support node according to claim 17, being further arranged to remove the existing tunnel to the first gateway support node in response to successful establishment of a tunnel to the second gateway support node.

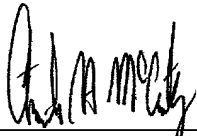
See the attached Appendix for the changes made to effect the Claims.

REMARKS

By this Amendment, the application is amended to merely clarify the recited and disclosed subject matter. No new subject matter has been added. An early and favorable Action on the merits is respectfully requested.

Respectfully submitted,

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APPENDIX
VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

1. (Amended) A method of controlling selection of a gateway support node to be used in a telecommunications system which comprises at least one support node serving a subscriber of the telecommunications system, a first and a second gateway support node, [characterized in that] wherein the method comprises the steps of:

defining at least one condition for the first gateway support node, so that when the condition is fulfilled, the second gateway support node is more suitable for transmitting packets,

detecting that the condition is fulfilled, and

sending a first message indicating the second gateway support node to the serving support node.

2. (Amended) A method according to claim 1, [characterized in that] the method further [comprises] comprising the steps of:

receiving in the first gateway support node a second message which indicates that a tunnel for transmitting packets between the subscriber and an external data network is to be established between the serving support node and the first gateway support node,

checking said condition, and

transmitting a first message to the serving support node if said condition is fulfilled,

or

establishing a tunnel if said condition is not fulfilled.

3. (Amended) A method according to claim 2, [characterized in that] wherein if the tunnel is established between the serving support node and the first gateway support node, the method further comprises the steps of:

detecting a change in operating conditions in the first gateway support node,
checking said condition, and

transmitting a third message indicating said second gateway support node to the serving support node and removing the tunnel in the first gateway support node if said condition is fulfilled.

4. (Amended) A method according to claim 3, [characterized in that] wherein the system is a GPRS system and said first and third messages are response messages to a 'Create PDP Context' request.

5. (Amended) A method according to claim 2, [characterized in that] wherein if the tunnel is established between the serving support node and the first gateway support node, the method further comprises the steps of:

detecting a change in operating conditions in the first gateway support node,
checking said condition, and

performing the next steps if said condition is fulfilled:

transmitting a fourth message indicating said second gateway support node to the serving support node,

waiting for an acknowledgement to said fourth message,

receiving the acknowledgement, and

removing the tunnel in the first gateway support node in response to a positive acknowledgement.

6. (Amended) A method according to claim 5, [characterized in that] wherein the system is a GPRS system and said first and fourth messages are response messages to a 'Create PDP Context' request.

7. (Amended) A method according to claim 1, [characterized in that] the method further [comprises] comprising the steps of:

establishing a tunnel between the serving support node and the first gateway support node,

detecting a change in operating conditions in the first gateway support node,

checking said condition, and

transmitting a first message to the serving support node if said condition is fulfilled.

8. (Amended) A method according to claim 7, [characterized by,] wherein if fulfilment of said condition is detected, removing the tunnel in the first gateway support node in response to the transmission of said first message.

9. (Amended) A method according to claim 7, [characterized by,] wherein if fulfilment of the condition is detected,

waiting for an acknowledgement to the first message,

receiving the acknowledgement, and

removing the tunnel in response to a positive acknowledgement.

10. (Amended) A packet-switched telecommunications system comprising a support node [(SGSN)] serving the subscriber of the telecommunications system, a first and a second gateway support node [(GGSN1, GGSN2, GGSN3)], [characterized in that] wherein in response to fulfilment of a predefined condition, the first gateway support node [(GGSN1)] is arranged to send to the serving support node [(SGSN)] a first message indicating the second gateway support node [(GGSN2, GGSN3)] which is more suitable for transmitting packets, and

in response to receiving the first message, the serving support node [(SGSN)] is arranged to activate establishment of the tunnel to be used in transmission of packets with the second gateway support node [(GGSN2, GGSN3)] indicated.

11. (Amended) A telecommunications system according to claim 10, [characterized in that] wherein

the telecommunications system comprises a database [(DB)] where information on the second gateway support nodes [(GGSN2, GGSN3)] defined for the first gateway support node [(GGSN1)] is maintained, and

the first gateway support node [(GGSN1)] is arranged to retrieve the most suitable second gateway support node [(GGSN2)] from the database when the predefined condition is fulfilled.

12. (Amended) A telecommunications system according to claim 10 [or 11, characterized in that] wherein the first gateway support node [(GGSN1)] is arranged to check at least one predefined condition in response to receiving a message requesting establishment of a tunnel from the serving support node [(SGSN)].

13. (Amended) A telecommunications system according to claim 10, [11 or 12, characterized in that] wherein

the telecommunications system comprises a tunnel used for transmitting packets between the serving support node [(SGSN)] and the first gateway support node [(GGSN1)], and

the first gateway support node [(GGSN1)] is arranged to detect a change in operating conditions and check at least one of said predefined conditions in response to detecting the change.

14. (Amended) A gateway support node [(GGSN1, GGSN2, GGSN3)] of a packet network which is arranged to communicate with the support node [(SGSN)] serving a subscriber of the packet network, [characterized in that] wherein

the gateway support node [(GGSN1)] is arranged to transmit, in response to fulfilment of a predefined condition, a first message indicating another gateway support node [(GGSN2, GGSN3)] which is more suitable for transmitting packets to the serving support node [(SGSN)].

15. (Amended) A gateway support node according to claim 14, [characterized in that] wherein the gateway support node [(GGSN1)] is arranged to check at least one said predefined condition in response to receiving a message requesting establishment of a tunnel from the serving support node [(SGSN)].

16. (Amended) A gateway support node according to claim 14 [or 15, characterized in that] wherein

there is a tunnel used for transmitting packets between the gateway support node [(GGSN1, GGSN2, GGSN3)] and the serving support node [(SGSN)], and the gateway support node [(GGSN1, GGSN2, GGSN3)] is arranged to detect a change in operating conditions and check at least one said predefined condition in response to detecting the change.

17. (Amended) A support node [(SGSN)] serving a subscriber of a packet network which is arranged to communicate with at least a first and a second gateway support node [(GGSN1, GGSN2, GGSN3)] of the packet network, [characterized in that] wherein

the serving support node is arranged, in response to the address of the second gateway support node included in the message received from the first gateway support node [(GGSN1)], to activate establishment of a tunnel used for transmitting packets with said second gateway support node [(GGSN2, GGSN3)].

18. (Amended) A serving support node according to claim 17, [characterized in that it is] being further arranged to remove the existing tunnel to the first gateway support node [(GGSN1)] in response to activation of tunnel establishment with the second gateway support node [(GGSN2, GGSN3)].

19. (Amended) A serving support node according to claim 17, [characterized in that it is] being further arranged to remove the existing tunnel to the first gateway support node [(GGSN1)] in response to successful establishment of a tunnel to the second gateway support node [(GGSN2, GGSN3)].

U/PRTS

CONTROL OF GATEWAY SUPPORT NODE SELECTION

BACKGROUND OF THE INVENTION

5 The invention relates to controlling selection of a gateway support node in a packet-switched network, and particularly to controlling selection of a packet-switched gateway support node in a mobile communication network.

10 Mobile communication networks function as effective access networks which provide the users with access to the actual data networks for mobile data transmission. Mobile data transmission is supported particularly well by digital mobile communication systems, such as the pan-European mobile communication system GSM (Global System for Mobile Communication). In this application the term 'data' refers to any information transmitted in a digital telecommunications system. Such information may comprise digitally encoded audio and/or video, inter-computer data traffic, telefax data, short sections of program codes, etc.

15 General packet radio service GPRS is a new service for the GSM system and one of the issues standardized by ETSI (European Telecommunication Standard Institute) in GSM phase 2+. The GPRS service enables packet data transmission between mobile data terminals and external data networks, while the GSM network functions as an access network. One of the requirements set on the GPRS service is that it should cooperate with different external data networks, such as the Internet or X.25 networks. In other words, the GPRS service and the GSM network should be able to serve all users regardless of the type of the data network they want to attach to via the GPRS service. This means that the GPRS service must support and process different network addresses and data packet forms. Processing of data packets also comprises routing of them in a packet radio network. Furthermore, the users should be able to roam from the home GPRS network to a visiting GPRS network the operator of which may have a backbone network supporting a different protocol (e.g. CLNP) than the home network (e.g. X.25). The logical network architecture of the GPRS service is illustrated in Figure 1.

20
25
30
35 Figure 1 illustrates the network architecture of a GPRS service at a general level because the detailed structure of the network is irrelevant to the invention. The GPRS service comprises an access network which provides

radio access and is the base station subsystem BSS of the GSM system in Figure 1, and support nodes of the GPRS service for packet-switched transmission of packet-switched data between a packet network PDN and a mobile station MS. The support nodes include a serving GPRS support node SGSN and a gateway GPRS support node GGSN. These different support nodes SGSN and GGSN are interconnected by a backbone network. It should be noted that the functionalities of the SGSN and the GGSN can also be physically combined into the same network node. Logically the nodes are, however, separate nodes.

The serving GPRS support node SGSN serves the mobile station MS. Each support node SGSN manages a packet data service within the area of one or more cells in a cellular packet radio network. For this purpose, each support node SGSN is typically connected to a base station subsystem BSS. The mobile station MS in a cell communicates with a base station over the radio interface and further through the base station subsystem with the support node SGSN to the service area of which the cell belongs.

The gateway GPRS support node GGSN connects the GPRS service of an operator to other data networks PDN, such as an IP network (Internet, Intranet) or X.25 network. The GGSN includes the routing information on GPRS subscribers, i.e. SGSN addresses and addresses of the external network related to the PDP contexts. The GGSN functions as a router between the external address and the internal routing information (e.g. SGSN). The GGSN may also transmit packets from one mobile station to another within the network.

A subscriber to the GPRS service has one or more external PDP addresses available. The PDP address is used for identifying a certain user context from the external network. A mobile station attached to the GPRS service may receive and/or transmit data packets with a certain PDP address provided that a corresponding packet data protocol PDP context is activated in the mobile station, serving support node and gateway support node. Activation of the PDP context establishes a tunnel between the support node SGSN serving the mobile station and the gateway support node GGSN. The tunnel is established using a GPRS tunnelling protocol GTP between the SGSN and the GGSN. The prior art tunnelling protocol is disclosed in ETSI specification GSM 09.60, version 6.2.0 (Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); GPRS Tunnelling Protocol (GTP)

across the Gn and Gp Interface). The tunnel is established in such a manner that the SGSN sends a 'Create PDP Context' request to the GGSN which either accepts or rejects it. If the GGSN accepts the create request, the tunnel is established. If the GGSN rejects the create request, the SGSN either sends
5 the create request to the next GGSN (if it has information on it) or informs the mobile station of the fact that the context cannot be activated. Selection of the next GGSN by the serving support node SGSN is based on static lists which are maintained e.g. in the internal name server of the GPRS service. After the tunnel has been established, the gateway support node GGSN can only either
10 reject or accept any update requests made by the serving support node or request the serving support node to remove the tunnel.

A problem related to the arrangement described above is that the gateway support node GGSN cannot at any stage indicate another gateway support node to the serving support node which would be a more suitable
15 gateway support node.

BRIEF DESCRIPTION OF THE INVENTION

An object of the invention is to provide a method and an apparatus implementing the method to eliminate the above-mentioned problems. The objects of the invention are achieved with a method, telecommunications
20 system and support nodes of a packet network which are characterized by what is disclosed in the independent claims. The preferred embodiments of the invention are described in the dependent claims.

The invention is based on the idea that the gateway support node suggests another more suitable gateway support node with which the tunnel should be established to the serving support node. The gateway support node
25 may make the suggestion either when it rejects the request for establishing a tunnel or when the conditions change so that it is practical to remove the existing tunnel.

An advantage of the method, system and support nodes of the invention is that the operator can distribute the load dynamically to the
30 gateway support nodes in the network and transfer the tunnel between the SGSN and the gateway support node to another gateway support node depending on the conditions, e.g. in connection with handover of serving support nodes.

In a preferred embodiment of the invention the messages which are sent to the serving support node and indicate the most suitable gateway support node are response messages to the 'Create PDP Context' request. A further advantage of this embodiment is that it is extremely simple to implement: one parameter/attribute is added to an existing message. This enables gradual introduction of the feature into a network, and thus both old serving support nodes lacking the inventive functionality and new serving support nodes with the functionality of the invention can be used simultaneously in the network without interfering with its function.

In a preferred embodiment of the invention where the end of an existing tunnel is to be transferred from one gateway support node to another, the tunnel is removed in the gateway support node only in response to a positive acknowledgement. A further advantage of this embodiment is that packets are not lost if there has not been time to establish a tunnel between the other gateway support node and the serving support node. This embodiment also allows to ensure at least satisfactory transmission of packets.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be described in greater detail by means of preferred embodiments with reference to the accompanying drawings, in which

Figure 1 illustrates the essential parts of the logical network architecture of a packet radio network;

Figure 2 is a flow chart illustrating the function of a first preferred embodiment according to the invention in a serving support node;

Figure 3 is a flow chart illustrating the function of a second preferred embodiment according to the invention in a serving support node;

Figure 4 is a signalling chart illustrating establishment of a tunnel according to the invention;

Figures 5 and 6 are signalling charts illustrating how one end of the tunnel is transferred from one gateway support node to another.

DETAILED DESCRIPTION OF THE INVENTION

The present invention is applicable to any packet-switched system which utilizes the tunnelling technique between the gateway support node and the serving support node. These include the third-generation mobile communication systems, such as the Universal Mobile Telecommunications

System (UMTS) and IMT-2000 (International Mobile Telecommunications 2000), mobile communication systems corresponding to the GSM system, such as the DCS 1800 (Digital Cellular System for 188 MHz) and PCS (Personal Communication System), and WLL systems which are based on the
5 above-mentioned systems and implement a GPRS type packet radio. However, the invention has been described using the GPRS service of the GSM system as an example, but naturally the invention is not limited to such a system. The definitions of mobile communication systems change rapidly, which may necessitate additional changes to the invention. For this reason, all
10 the terms and expressions should be interpreted broadly, and it should also be kept in mind that they are only intended to describe the invention, not to limit it.

The subnetwork BSS, network elements SGSN and GGSN and external packet data network PDN shown in Figure 1 were described in greater detail above. The structure and function of the GSM system are very
15 familiar to a person skilled in the art. The structure of the GPRS service, for example, is defined in ETSI specification 03.60, version 6.0.0 (Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Service Description; Stage 2). The example shown in Figure 1 illustrates the fact that the SGSN may communicate with the packet data
20 network PDN via several gateway support nodes GGSN1, GGSN2, GGSN3. These gateway support nodes may also be located in different mobile communication networks PLMN A and PLMN B. One GGSN may similarly communicate with several serving support nodes SGSN, even though this is not illustrated in the figure.

25 In addition to the prior art functions, the support nodes SGSN and GGSN of the system according to the invention are arranged to perform the functions to be explained in connection with Figures 2 to 6. They comprise processors and memory which can be utilized in the functions of the invention. All changes needed to implement the invention can be carried out as
30 additional or updated software routines.

In addition, the system may comprise means for storing recommendable gateway support nodes in the memory. The memory means are preferably located in a centralized database DB. The memory means or some of them may also be divided between the network elements, e.g. each
35 gateway support node GGSN may have a list of its own. In the latter case the gateway support nodes GGSN may also need additional memory. The

information in the database can be updated e.g. via network management (not shown). For example, the recommended gateway support nodes can be stored so that each gateway support node SGSN has a list of its own from which a suitable support node is selected according to the features and available resources. The way in which the lists are maintained or the grounds on which the selection is made is irrelevant to the invention. It is essential that the gateway support node receives, when needed, information on a better/more recommendable gateway support node. It may also receive this information directly from the operator, and thus the memory is not necessary.

Figure 2 is a flow chart illustrating the function of the gateway support node GGSN according to the first preferred embodiment of the invention in respect of one PDP context. In step 201 a 'Create PDP Context' request (or Create AA PDP Context request) is received from the serving support node. In step 202 it is checked whether the gateway support node supports the desired service, such as an IP-based connection or a connection to a certain company network. If the gateway support node supports the desired service, it is checked in step 203 whether the gateway support node can provide the necessary capacity, e.g. the desired quality of service. If the gateway support node is capable of offering the necessary capacity, it is checked in step 204 whether the load of the gateway support node is below the limit value set by the operator. The operator may set a fixed limit value or change it according to the load. For example, when there is a lot of traffic in the network, the limit value may be 95% of the maximum load, but if the amount of traffic is small, the limit value may be changed to 50% of the maximum load. If the load is smaller than the limit value, a positive response is sent to the serving support node in step 205 (Create PDP Context Response (request accepted) or Create AA PDP Context Response (request accepted)). Thereafter it is checked in step 206 whether the PDP context already exists. If there is no PDP context, it is created in step 207. If a PDP context exists, it is updated in step 208.

From steps 207 and 208 we move to step 209 where the situation of the gateway support node is monitored. During monitoring it is checked in step 210 whether the situation is OK. This is found out e.g. by comparing the load and the limit value. The limit value can be changed even though a tunnel would already exist to divide the load between the gateway support nodes. If the situation is OK, we continue monitoring. If the situation is not OK, e.g. the

load situation changes and the operator wants to divide the load, the address of a more recommendable GGSN is retrieved in step 211. Thereafter in step 212 the serving support node is informed of the fact that the gateway support node has to be changed. The information to be sent includes the address of the recommended gateway support node. In the first preferred embodiment step 212 is performed by sending a negative response which includes information on the gateway support node recommended by the gateway support node (Create PDP Context Response (cause, GGSN2) or Create AA PDP Context Response (cause, GGSN2)). In other words, in the first preferred embodiment the GGSN may send the same message as when responding to the Create PDP Context request even when the PDP context is activated and the tunnel exists. In other embodiments another message may also be sent to transfer the end of the tunnel. Alternative messages include Delete PDP Context Request (GGSN2) and Reset PDP Context GGSN2. In the first preferred embodiment the PDP context is deleted in step 213 after the negative response has been sent.

If it is noted in step 202 that the requested service is not supported, we move to step 214 to retrieve the address of the more recommendable GGSN. Then a negative response including information on the gateway support node recommended by the gateway support node (Create PDP Context Response (cause, GGSN2) or Create AA PDP Context Response (cause GGSN2)) is sent in step 215. Thereafter it is checked in step 216 whether a PDP context already exists, and if there is a PDP context, it is deleted in step 217. In some other embodiments the PDP context is not necessarily deleted in step 217, but the PDP context is either retained or deleted, depending on the case and the purpose of use. The tunnel, however, is removed. The same can also be done in step 213.

If there is no capacity available, we move to step 214 from step 203. If the load is not below the limit value, we move to step 214 from step 204.

When the load is calculated, the level of quality of service, i.e. QoS level, wished for the context in question can also be taken into account. In that case the desired QoS parameter values sent in the request are checked and it is evaluated whether the desired quality of service can be reached/guaranteed in step 204. If the desired quality of service cannot be reached or guaranteed,

it is possible to indicate a GGSN which could support the desired service better.

Steps 203, 204 and 205 exemplify some conditions which the operator may define to distribute the load or to use the gateway support nodes supporting different services. The conditions for rejecting creation of a context may differ from what has been described above. The conditions may also vary according to the load situation or be independent of the load situation. Furthermore, the conditions may be defined separately for each gateway support node or the conditions or some of them may be defined jointly e.g. in a database which includes the lists of the most recommendable gateway support nodes. The condition may be gateway support node-specific, such as a supported service, or common to all gateway support nodes of the same operator. A common condition could be e.g. that the tunnel of a visiting mobile station is established in the home network. For example, if the mobile station MS is a subscriber of the PLMN B network in the situation illustrated in Figure 1, the condition defined for the GGSN1 or GGSN 2 (or for them in a database, for example) may be that the subscribers of the PLMN B are routed to the GGSN3. It is essential that at least one condition has been defined and the GGSN is given the address of another GGSN which it may include in the negative response.

In some other preferred embodiments of the invention transfer of the tunnel end to another gateway support node, i.e. steps 209, 210, 211, 212 and 213, can be omitted.

Figure 3 is a flow chart illustrating the function of the serving support node SGSN according to the first preferred embodiment of the invention in respect of one PDP context. In step 301 a negative response to the 'Create PDP Context' request is received from the serving support node (Create PDP Context Response (cause) or Create AA PDP Context Response (cause)). In step 302 it is checked whether the corresponding PDP context is active. If it is, it is set to wait for a response in step 303 after which we move to step 304. If the PDP context is inactive, we move to step 304 straight from step 302. In step 304 it is checked whether the response included the address of the recommended gateway support node GGSN in addition to the cause. If it includes the address, it is checked in step 305 whether the same GGSN address is on the GGSN list of the SGSN. If it is listed, it is marked as used on the SGSN's own list in step 306, after which we move to step 307. By marking

the node as used we ensure that two create requests are not sent to the same GGSN. If the SGSN's list does not include the GGSN address, we move straight to step 307 where a 'Create PDP Context' request is sent to the GGSN indicated in the negative response. In step 308 a response is received
5 from the GGSN. In step 309 it is checked whether the response was negative. If it was negative, we move to step 304 to check whether the response included the GGSN address in addition to the cause. If the response was positive (Create PDP Context Request (request accepted) or Create AA PDP Context (request accepted)), a PDP context is activated in step 310 and a
10 tunnel established between the serving support node SGS and the gateway support node GGSN in step 311.

If it is noted in step 304 that the negative response did not include the GGSN address, it is checked in step 312 whether there are unused GGSN addresses on the GGSN list of the serving support node. If this is the case, the
15 address on the top of the list is chosen in step 313 and marked as used in step 314, after which we move to step 307 to send a 'Create PDP Context' request. When this route is used, the create request is always sent to the GGSN selected from the SGSN's own list. If it is noted in step 312 that there are no unused GGSN addresses on the list of the serving support node, a failure will
20 occur (step 315) and packets cannot be transmitted.

In some other preferred embodiments of the invention steps 305, 306, 312, 313 and 314 are not performed at all. In that case the gateway support node is solely responsible for finding the alternative gateway support node.

25 The steps described in Figures 2 and 3 are not in absolute chronological order and some of the steps can be performed simultaneously or in a different order. These steps include steps 202, 203 and 294 and steps 314 and 307. Other functions may also be performed between the steps, e.g. in Figure 2 data of the PDP context, such as the SGSN address, may be
30 updated, or the PDP context may be deleted in response to a delete request sent by the SGSN. It is also possible to wait for an acknowledgement from the serving support node between steps 212 and 213 of Figure 2 and delete the PDP context only in response to an acknowledgement which indicates that another tunnel has been established successfully. In the embodiments of the
35 invention where the negative response is used only when the tunnel is established, another message, e.g. delete or reset, is sent in step 212. In that

case at least steps 302 and 303 are omitted from the example of Figure 3 when the negative response is received. When another message is received, these steps are performed.

5 Figures 4, 5 and 6 illustrate examples of signalling according to the invention in different embodiments. Signalling is based on ETSI recommendation GSM 09.60 version 6.2.0, which is incorporated herein by reference.

Figure 4 illustrates signalling related to PDP context activation. In the example of Figure 4 the mobile station MS sends an 'Activate PDP Context' request to the serving support node SGSN in message 4-1. Having received the message the serving support node SGSN and the mobile station MS carry out security functions in message 4-2. After the security functions have been performed, the serving support node SGSN sends a 'Create PDP Context' request to the gateway support node GGSN1 in message 4-3. Messages 4-1, 4-2 and 4-3 are in accordance with the prior art. Having received message 4-3 the gateway support node GGSN1 checks in step 4-4 whether the conditions (or condition) for acceptance are fulfilled. If necessary, the limit value related to the condition or the condition is retrieved from a database. This is not, however, shown in Figure 4. Examples of the conditions are given in connection with Figure 2. In the example of Figure 4 it is assumed that the GGSN1 cannot accept the PDP context request. Thus it requests the address of a more suitable GGSN from the database DB in message 4-5. The message may contain information on the condition which caused rejection and the cause of rejection. The message may also contain all parameters and attributes transmitted in message 4-3. The database retrieves the address GGSN2 on the basis of the information given in message 4-5 and sends it back in message 4-6. Messages 4-5 and 4-6 are not actual signalling messages. Messages 4-5 and 4-6 are used for indicating the database search performed in this step. Having received message 4-6 the gateway support node GGSN1 sends a 'Create PDP Context' response the cause parameter of which differs from the 'request accepted value' to the serving support node SGSN in message 4-7. The message also contains the address of the GGSN2. The serving support node SGSN separates the address from message 4-7 in step 4-8 and sends a 'Create PDP Context' request to the gateway support node GGSN2 in message 4-9. Message 4-9 is in accordance with the prior art. Having received message 4-9 the gateway support node

GGSN2 checks in step 4-10 whether the conditions (or condition) for acceptance are fulfilled. In this case the conditions (or condition) are fulfilled and the gateway support node GGSN2 sends a 'Create PDP Context' response the cause parameter of which is 'request accepted' to the serving support node SGSN in message 4-11. In other words, message 4-11 is a positive response. The serving support node SGSN transmits the acceptance to the mobile station MS according to the prior art by sending an 'Active PDP Context' accept in message 4-12. After this the PDP context is activated from the mobile station, which can send and receive packets.

The PDP context activation illustrated in Figure 4 can be performed when the mobile station attaches to the GPRS network. Alternatively, the user may activate the context or activation may be performed in response to a PDP context activation request received from the GPRS network.

Figure 5 is a signalling chart illustrating a situation in which a tunnel has been established between the SGSN and the GGSN2. In other words, the PDP contexts are active. In step 5-1 the operating conditions of the gateway support node change. For example, the operator drives the gateway support node down or the load of the gateway support node exceeds the limit value because the limit value has been changed. Change of the operating conditions may also be an update of the PDP context received from the serving support node e.g. as the desired quality of service or the serving support node changes. Thus one end of the tunnel is to be transferred from the GGSN2 to another gateway support node. As a result of this, the gateway support node sends message 5-2 to the serving support node SGSN. Depending on the embodiment, the message may be a 'Create PDP Context' response the cause parameter value of which differs from the 'request accepted' value, a 'Delete PDP Context' or a 'Resent PDP Context'. Regardless of the type of the message it always contains the address of a new, more suitable gateway support node GGSN3 which is either obtained from the operator or retrieved from the database. Having sent the message the GGSN 2 deletes the PDP context in step 5-3, i.e. removes the tunnel. Having received message 5-2 the serving support SGSN removes the tunnel to the GGSN2 in step 5-4, separates the address from message 5-2 and sends a 'Create PDP Context' request to the gateway support node GGSN3 in message 5-5. Having received message 5-5 the gateway support node GGSN3 checks in step 5-6 whether the conditions (or condition) for acceptance are fulfilled. This time the

conditions (or condition) are fulfilled and the gateway support node GGSN3 sends a 'Create PDP Context' response the cause parameter of which is 'request accepted' to the serving support node SGSN in message 5-7. Thereafter the SGSN establishes a new tunnel and continues transmission of packets using this new tunnel. The mobile station does not need to be informed of the new tunnel.

If the conditions are not fulfilled in step 5-6, the gateway support node proposes another gateway support node. If no suitable gateway support node is found, a failure will occur and packets can no longer be transmitted.

Figure 6 illustrates a signalling chart of a situation in which a tunnel has been established between the SGSN and the GGSN2. In other words, the PDP contexts have been activated. In step 6-1 the operating conditions change. For example, the load of the gateway support node exceeds the limit value because the limit value has been changed. As a result, the gateway support node sends message 6-2 to the serving support node SGSN. Preferably the message is 'Reset PDP Context'. Message 6-2 contains the address GGSN3 of a new, more suitable gateway support node which is either obtained from the operator or retrieved from the database. Having received message 6-2 the serving support node separates the address from message 6-2 in step 6-3 and sends a 'Create PDP Context' request to the gateway support node GGSN3 in step 6-4. Having received message 6-4 the gateway support node GGSN3 checks in step 6-5 whether the conditions (or condition) for acceptance are fulfilled. This time the conditions (or condition) are fulfilled and the gateway support node GGSN3 sends a 'Create PDP Context' response the cause parameter of which is 'request accepted' to the serving support node SGSN in message 6-6. Having received the positive response in message 6-6 the SGSN removes the tunnel to the GGSN2 in step 6-7 by sending a positive acknowledgement (ResetPDPContextAck) to the GGSN2. In step 6-8 the SGSN creates a new tunnel with the GGSN3 and continues transmission of packets using this new tunnel. The mobile station does not need to be informed of the new tunnel. When the GGSN2 receives a positive acknowledgement, it deletes the PDP context in step 6-9.

If the conditions are not fulfilled in step 6-5, the gateway support node GGSN3 sends a negative response (e.g. message 4-7 of Figure 4), and the SGSN may try to establish a tunnel with the gateway support node suggested by the GGSN3. If the SGSN received the negative response

without a new gateway support node address, it will send a negative acknowledgement to the GGSN2 and will not remove the tunnel with it. In that case the GGSN2 searches for another PDP context which it tries to transfer to another gateway support node to divide the load evenly. Alternatively, having
5 received the negative response from the GGSN3 the SGSN can always send a negative acknowledgement to the GGSN2, which may also search for a new gateway support node address to be sent to the SGSN.

A preferred embodiment of the invention utilizes each of the signalling types illustrated in Figures 4, 5 and 6. Depending on the change of
10 operating conditions detected in the gateway support node either signalling 5 or signalling 6 is selected e.g. according to the instructions given by the operator. The instructions may be included in the condition. Signalling 5 is selected when the operator drives the gateway support node down, for example, whereas signalling 6 is selected in connection with the update of the
15 PDP context. In this embodiment messages 5-2 and 6-2 must differ from each other so that the serving support node knows which signalling is concerned. The simplest way to distinguish one message from the other is to use messages with different names.

In preferred embodiments of the invention it is possible to use only
20 one or two of the examples illustrated in Figures 4, 5, 6.

The steps and signalling messages shown in Figures 4, 5 and 6 are not in absolute chronological order and some of the steps may be performed simultaneously or in a different order. The signalling messages are only exemplary and may even comprise several separate messages for
25 transmitting the same information. In addition, the messages may contain other information. The messages can also be combined freely or divided into several parts. Furthermore, the names of the messages may differ from the above-mentioned ones. It is essential that the gateway support node is capable of sending control information to the serving support node when
30 another gateway support node is more suitable than the current gateway support node. Depending on the network structure, other network elements between which different functionalities have been divided may participate in data transmission and signalling.

Even though in connection with Figures 4, 5 and 6 only ordinary
35 PDP contexts have been used as examples, the same functionality of the

CLAIMS

1. A method of controlling selection of a gateway support node to be used in a telecommunications system which comprises at least one support node serving a subscriber of the telecommunications system, a first and a second gateway support node,

5 **characterized** in that the method comprises the steps of:
 defining at least one condition for the first gateway support node, so that when the condition is fulfilled, the second gateway support node is more suitable for transmitting packets,
 10 detecting that the condition is fulfilled, and
 sending a first message indicating the second gateway support node to the serving support node.

2. A method according to claim 1, **characterized** in that the method further comprises the steps of:

15 receiving in the first gateway support node a second message which indicates that a tunnel for transmitting packets between the subscriber and an external data network is to be established between the serving support node and the first gateway support node,
 checking said condition, and
 20 transmitting a first message to the serving support node if said condition is fulfilled, or
 establishing a tunnel if said condition is not fulfilled.

3. A method according to claim 2, **characterized** in that if the tunnel is established between the serving support node and the first gateway support node, the method further comprises the steps of:

25 detecting a change in operating conditions in the first gateway support node,
 checking said condition, and
 transmitting a third message indicating said second gateway support node to the serving support node and removing the tunnel in the first gateway support node if said condition is fulfilled.

30 4. A method according to claim 3, **characterized** in that the system is a GPRS system and said first and third messages are response messages to a 'Create PDP Context' request.

5. A method according to claim 2, **characterized** in that if the tunnel is established between the serving support node and the first gateway support node, the method further comprises the steps of:

- 5 detecting a change in operating conditions in the first gateway support node,
checking said condition, and
performing the next steps if said condition is fulfilled:
transmitting a fourth message indicating said second gateway support node to the serving support node,
10 waiting for an acknowledgement to said fourth message,
receiving the acknowledgement, and
removing the tunnel in the first gateway support node in response to a positive acknowledgement.

6. A method according to claim 5, **characterized** in that the system is a GPRS system and said first and fourth messages are response messages to a 'Create PDP Context' request.

7. A method according to claim 1, **characterized** in that the method further comprises the steps of:

- 20 establishing a tunnel between the serving support node and the first gateway support node,
detecting a change in operating conditions in the first gateway support node,
checking said condition, and
transmitting a first message to the serving support node if said condition is fulfilled.

8. A method according to claim 7, **characterized** by, if fulfilment of said condition is detected, removing the tunnel in the first gateway support node in response to the transmission of said first message.

9. A method according to claim 7, **characterized** by, if
30 fulfilment of the condition is detected,
waiting for an acknowledgement to the first message,
receiving the acknowledgement, and
removing the tunnel in response to a positive acknowledgement.

10. A packet-switched telecommunications system comprising

a support node (SGSN) serving the subscriber of the telecommunications system, a first and a second gateway support node (GGSN1, GGSN2, GGSN3), **characterized** in that

5 in response to fulfilment of a predefined condition, the first gateway support node (GGSN1) is arranged to send to the serving support node (SGSN) a first message indicating the second gateway support node (GGSN2, GGSN3) which is more suitable for transmitting packets, and

10 in response to receiving the first message, the serving support node (SGSN) is arranged to activate establishment of the tunnel to be used in transmission of packets with the second gateway support node (GGSN2, GGSN3) indicated.

11. A telecommunications system according to claim 10, **characterized** in that

15 the telecommunications system comprises a database (DB) where information on the second gateway support nodes (GGSN2, GGSN3) defined for the first gateway support node (GGSN1) is maintained, and

the first gateway support node (GGSN1) is arranged to retrieve the most suitable second gateway support node (GGSN2) from the database when the predefined condition is fulfilled.

20 12. A telecommunications system according to claim 10 or 11, **characterized** in that the first gateway support node (GGSN1) is arranged to check at least one predefined condition in response to receiving a message requesting establishment of a tunnel from the serving support node (SGSN).

25 13. A telecommunications system according to claim 10, 11 or 12, **characterized** in that

the telecommunications system comprises a tunnel used for transmitting packets between the serving support node (SGSN) and the first gateway support node (GGSN1), and

30 the first gateway support node (GGSN1) is arranged to detect a change in operating conditions and check at least one of said predefined conditions in response to detecting the change.

35 14. A gateway support node (GGSN1, GGSN2, GGSN3) of a packet network which is arranged to communicate with the support node (SGSN) serving a subscriber of the packet network, **characterized** in that

the gateway support node (GGSN1) is arranged to transmit, in response to fulfilment of a predefined condition, a first message indicating another gateway support node (GGSN2, GGSN3) which is more suitable for transmitting packets to the serving support node (SGSN).

5 15. A gateway support node according to claim 14, **characterized** in that the gateway support node (GGSN1) is arranged to check at least one said predefined condition in response to receiving a message requesting establishment of a tunnel from the serving support node (SGSN).

10 16. A gateway support node according to claim 14 or 15, **characterized** in that

there is a tunnel used for transmitting packets between the gateway support node (GGSN1, GGSN2, GGSN3) and the serving support node (SGSN), and

15 the gateway support node (GGSN1, GGSN2, GGSN3) is arranged to detect a change in operating conditions and check at least one said predefined condition in response to detecting the change.

20 17. A support node (SGSN) serving a subscriber of a packet network which is arranged to communicate with at least a first and a second gateway support node (GGSN1, GGSN2, GGSN3) of the packet network, **characterized** in that

the serving support node is arranged, in response to the address of the second gateway support node included in the message received from the first gateway support node (GGSN1), to activate establishment of a tunnel used for transmitting packets with said second gateway support node (GGSN2, GGSN3).

25 18. A serving support node according to claim 17, **characterized** in that it is arranged to remove the existing tunnel to the first gateway support node (GGSN1) in response to activation of tunnel establishment with the second gateway support node (GGSN2, GGSN3).

30 19. A serving support node according to claim 17, **characterized** in that it is arranged to remove the existing tunnel to the first gateway support node (GGSN1) in response to successful establishment of a tunnel to the second gateway support node (GGSN2, GGSN3).

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ABSTRACT:

The invention relates to controlling selection of a gateway support node of a packet-switched network. The invention comprises defining at least one condition (202, 203, 204) for the gateway support node. When the condition is fulfilled, another gateway support node is more suitable for transmitting packets. When fulfillment of the condition is detected, a first message indicating the other gateway support node is transmitted (215) to the serving support node.

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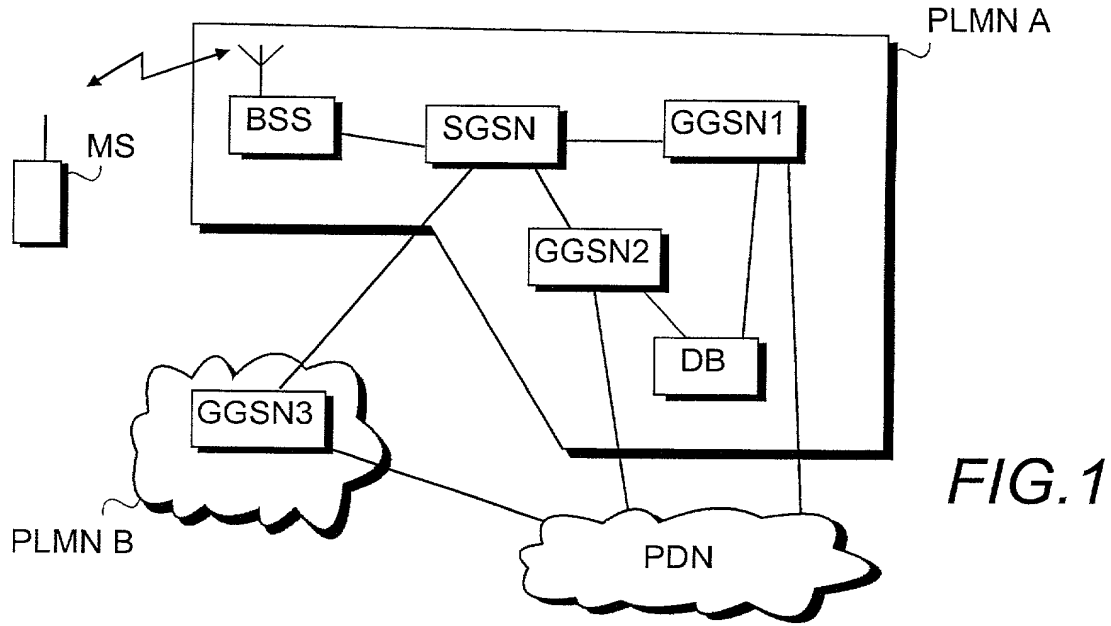


FIG.1

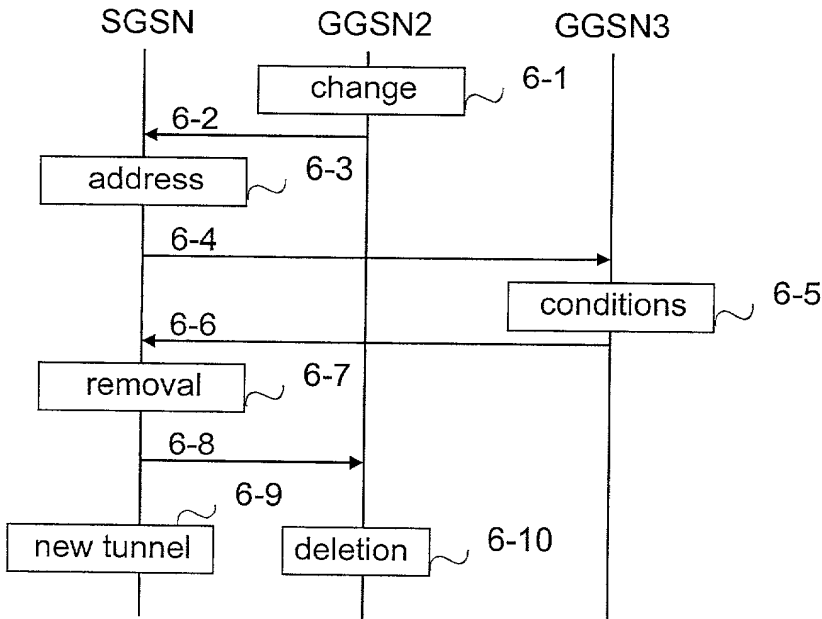


FIG.6

FIG. 1

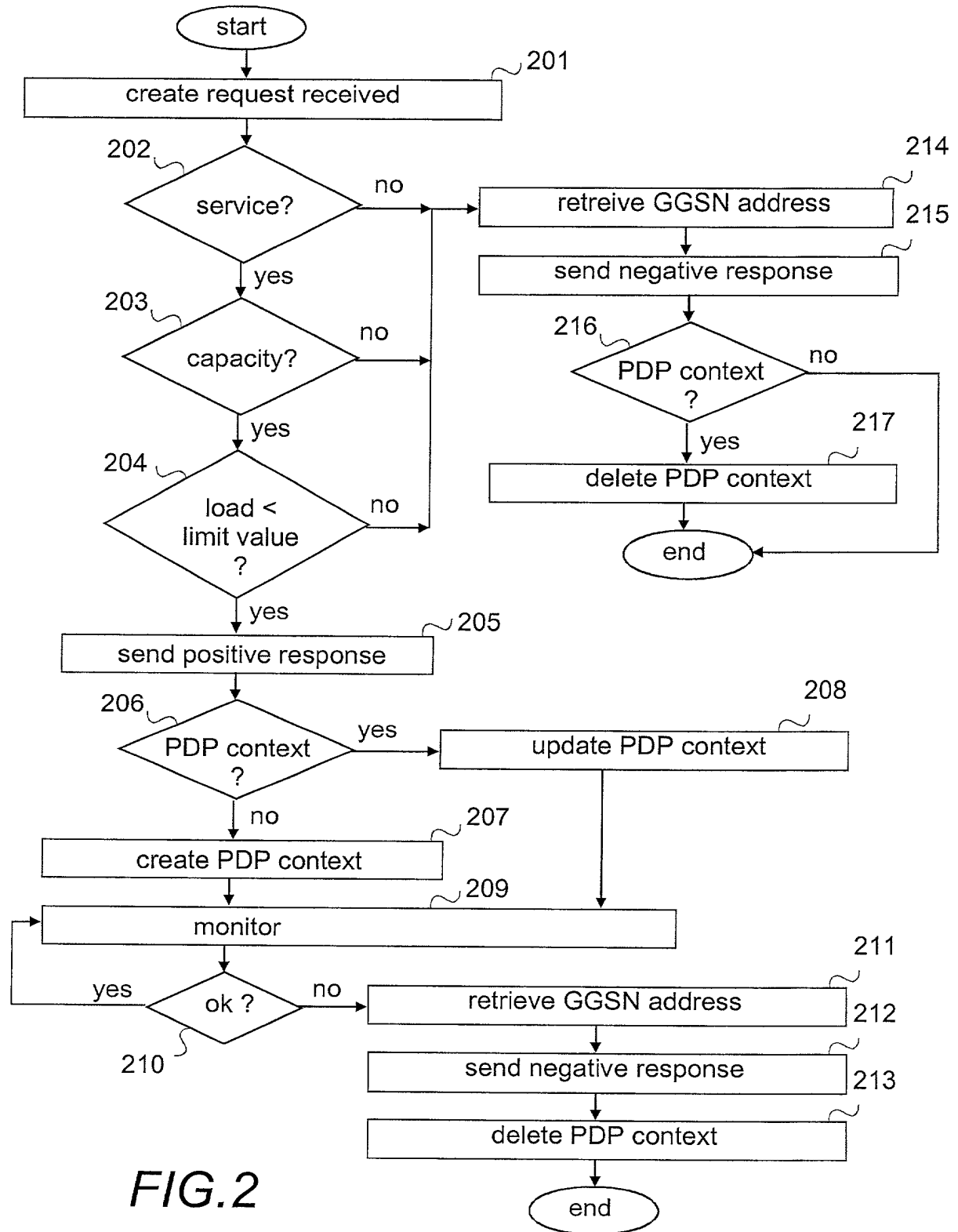
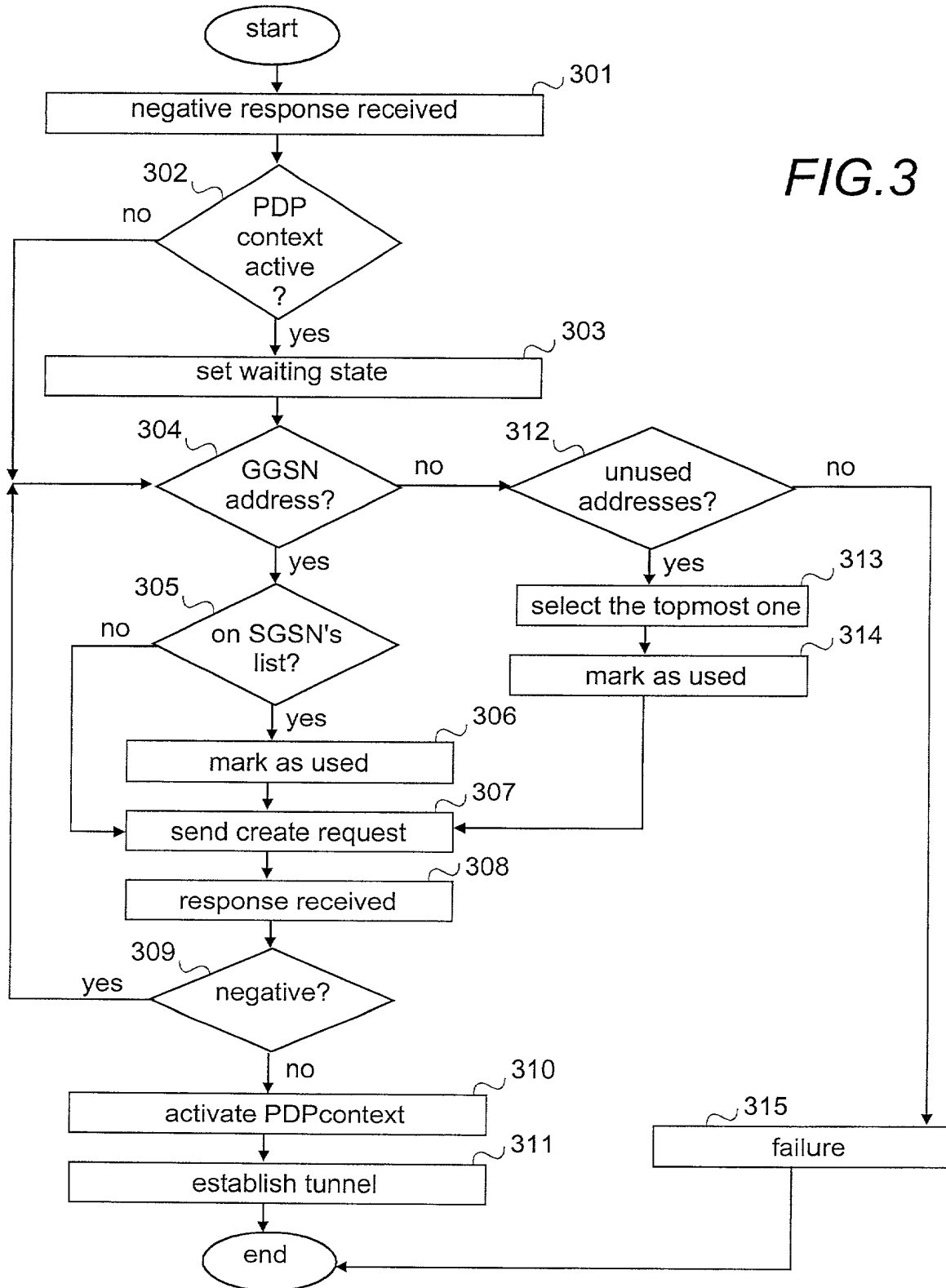


FIG.3



FOR UTILITY/DESIGN
CIP/PCT NATIONAL/PLANT
ORIGINAL/SUBSTITUTE/SUPPLEMENTAL
DECLARATIONS

RULE 63 (37 C.F.R. 1.63)
DECLARATION AND POWER OF ATTORNEY
FOR PATENT APPLICATION

PW #3
FORM

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

As a below named inventor, I hereby declare that my residence, post office address and citizenship are as stated below next to my name, and I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the INVENTION ENTITLED Control of gateway support node selection

the specification of which: (CHECK applicable BOX(ES))

X
BOX(ES) → A. is attached hereto.
→ B. was filed on _____ as U.S. Application No. _____
→ C. was filed as PCT International Application No. PCT/ FI99/01083 on 28 December 1999

and (if applicable to U.S. or PCT application) was amended on _____
I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above. I acknowledge the duty to disclose all information known to me to be material to patentability as defined in 37 C.F.R. 1.56. Except as noted below, I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(e) or 365(b) of any foreign application(s) for patent or inventor's certificate, or 365(a) of any PCT International Application which designated at least one other country than the United States, listed below and have also identified below any foreign application for patent or inventor's certificate, or PCT International Application, filed by me or my assignee disclosing the subject matter claimed in this application and having a filing date (1) before that of the application on which priority is claimed, or (2) if no priority claimed, before the filing date of this application:

WHICH FOREIGN APPLICATION(S)

Number	Country	Day/MONTH/Year Filed	Date first Laid-open or Published	Date Patented or Granted	Priority NOT Claimed
082855	Finland	31.12.1998			

If more prior foreign applications X box at bottom and continue on attached page.

Except as noted below, I hereby claim domestic priority benefit under 35 U.S.C. 119(e) or 120 and/or 305(c) of the indicated United States applications listed below and PCT International applications listed above or below and, if this is a continuation-in-part (CIP) application, insofar as the subject matter disclosed and claimed in this application is in addition to that disclosed in such prior applications, I acknowledge the duty to disclose all information known to me to be material to patentability as defined in 37 C.F.R. 1.56 which became available between the filing date of each such prior application and the national or PCT International filing date of this application:

PRIOR U.S. PROVISIONAL, NONPROVISIONAL AND/OR PCT APPLICATION(S)

Application No. (series code/serial no.)	Day/MONTH/Year Filed	Status	Priority NOT Claimed
PCT/FI99/01083	28 December 1999	pending, abandoned, patented	

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

And I hereby appoint Pillsbury Winthrop LLP, Intellectual Property Group, telephone number (202) 861-3000 (to whom all communications are to be directed), and persons of that firm who are associated with USPTO Customer No. 909 (see below label) individually and collectively my attorneys to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith and with the resulting patent, and I hereby authorize them to delete from that Customer No. names of persons no longer with their firm, to add new persons of their firm to that Customer No., and to act and rely on instructions from and communicate directly with the person/assignee/attorney/firm/ organization who/which first contacted this case to them and by whom/which I hereby declare that I have consented after full disclosure to be represented unless/until I instruct the above firm and/or an attorney of that firm in writing to the contrary.

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- FOR ADDITIONAL INVENTORS see attached page.
- See additional foreign priorities on attached page (incorporated herein by reference).

Atty. Dkt. No. P

(M#)